APPARATUS AND METHOD FOR GENERATING PRESSURE CHANGES IN A MAMMALIAN ORAL/THROAT CAVITY

FIELD OF THE INVENTION

This invention relates generally to methodology and apparatus for establishing predetermined vacuum or pressure levels in the mouth and throat cavity of a mammalian body, such as that of a human, in coordination with the mammal's respiratory pattern.

BACKGROUND OF THE INVENTION

This invention is based on my discovery that respiration-regulated air pressure, either positive or negative (vacuum), in a person's mouth and throat cavity, produces beneficial effects to the person's health such as alleviation of throat discomfort and snoring. The hypothetical explanation of this finding is that respiration-regulated air pressure in a person's mouth and throat cavity stimulate the body's autonomic nervous system, circulatory system, and especially lymphatic system and therefore enhances certain physiological functions, such as lymphatic flow. The body's autonomic nervous system, circulatory system, and lymphatic system are all responsive to pressure changes in the respiration system while a person is inhaling and exhaling. For example, J. W. Shields has conducted a study on the effects of breathing on the lymphatic system. Using cameras inside the body, he found that deep, diaphragmatic breathing stimulated the cleansing of the lymph system by creating a vacuum effect which draws lymph through the bloodstream. See *Human Central Lymph Propulsion*, JAMA, Vol. 246, No. 18, Nov. 6, 1981, Shields, et al.

SUMMARY OF THE INVENTION

Accordingly, in one aspect of the invention, a method for inducing pressure changes in the mouth and throat cavity of a mammal includes the steps of monitoring a respiration pattern of the mammal to determine a first time period during which the mammal is inhaling and a second time period during which the mammal is exhaling. A partial vacuum is induced in the mammal's mouth and throat cavity during the first time period and the partial vacuum is removed during the second time period.

In another aspect of the invention apparatus for inducing pressure changes in the mouth and throat cavity of a mammal includes a regulated vacuum source having an outlet and a control input, an appliance in fluid communication with the outlet of the vacuum source, the appliance adapted for placement in a mouth of a mammal so as to be in fluid communication therewith. A sensor, adapted to be coupled at a preselected portion of the mammal's anatomy and operative to generate a first signal whenever the mammal inhales and a second signal whenever the mammal exhales, signals a controller having an output coupled for controlling the output of the vacuum source. The controller has at least one input coupled for receipt of the first and second signals from the sensor. The controller is operative upon receipt of the first signal to cause the vacuum source to pull at least a partial vacuum in the appliance. The controller is operative upon receipt of the second signal to cause removal of the partial vacuum from the appliance.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects and features of the invention will become apparent from a reading of a detailed description taken in conjunction with the drawings, in which:

FIG. 1 is a functional block diagram of a first embodiment of a system arranged in accordance with the principles of the invention;

FIG. 2 is a functional schematic of sensor element suitable for use in the system of FIG. 1;

FIGS. 3A and 3B are side and top cross sectional views of an oral appliance arranged in accordance with the principles of the invention;

FIG. 4 is a timing diagram showing the output of sensor 144 of FIG. 1 in relation to a typical respiratory pattern; and

FIG. 5 is a functional block diagram of an alternative embodiment of the invention.

DETAILED DESCRIPTION

FIG. 1 sets forth a functional diagram of apparatus arranged in accordance with the invention. System **100** includes a vacuum source or pump **110** having an outlet **112** coupled to a first end of a conduit **182**. An opposite end of conduit **182** is coupled to an inlet of regulator **180**. An output of regulator **180** is coupled via conduit **172** to a vacuum chamber **170**. Chamber **170** is coupled via conduit **163** to a first port **162***a* of fluid flow valve or fluid switch **160**. A second port **162***b* of switch **160** is vented to the atmosphere via conduit **161**. Port **162***c* of switch **160** is coupled via a preferably flexible conduit **125** to an inlet port **122** of oral appliance or appliance element **120** which is sized and shaped for facile insertion into the mouth of an individual.

Appliance **120** is substantially disk shaped and has a hollow interior **132** in fluid communication with the conduit **125** via appliance inlet **122**. Additionally a plurality of passages **126**, **128** and **130** are arranged in a preselected pattern on at least one side of appliance **120** for providing fluid communication between interior **132** of appliance **120** and the mouth and throat cavity of the individual.

Sensor **140**, for generating an indication of whether or not the individual is inhaling or exhaling, includes a belt **142** for engagingly surrounding the abdominal cavity of the user. Ends of the belt **142** terminate at a sensor element **144** which is operative to generate signals indicating inhaling and exhaling. The signals are coupled via bus **146** to an input **154** of a controller **150**. Controller **150** may, for example, take the form of a stored program type controller such as a microprocessor-based element. Output **152** of controller **150** is coupled via bus **155** to a control input **181** of regulator **180**. A second output **153** of controller **150** is coupled via bus **156** to a control input **164** of fluid switch **160**.

In operation, system **100** generates desired pressure levels by having the individual utilizing the system insert the appliance **120** into the oral cavity and by strapping belt **142** about the individual's abdominal cavity. Upon inhaling in the midst of a normal breathing pattern, an appropriate signal is developed by sensor **144** and coupled to controller **150**. Controller **150**, via bus **155**, enables regulator **180** to regulate the output **112** of vacuum source **110** at a preselected vacuum level. Upon receipt of the inhaling indication signal, controller **150** signals switch **160** via bus **156** to fluidly couple port **162***a* to port **162***c* thereby enabling at least a partial vacuum to be pulled at the interior **132** of appliance **120** via conduit **125**. This partial vacuum is extended into the mouth and throat cavity via passages **126**, **128** and **130**. Upon cessation of the inhaling cycle and initiation of the exhaling cycle of the breathing pattern, an appropriate signal at sensor **144** is coupled to controller **150** which signals switch **160** via bus **156** to switch port **162***c* from its fluid connection to port **162***a* over to port **162***b*, thereby venting conduit **125** and appliance **120** to the